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**ASSESSMENT OF INCOME DISTRIBUTION IN HUNGARY  
USING A MICROSIMULATION MODEL**

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This paper reflects the views of the authors and  
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Section 2 of this paper is based on a presentation delivered at the Hungarian Ministry of Finance on 12 September 2003 by John Hills (London School of Economics): The use of tax-benefit microsimulation models.

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## **Executive Summary**

### **What is microsimulation?**

Microsimulation is a technique that assesses the micro-level impacts on households or individuals of certain economic policy measures. Microsimulation is aimed at identifying the effects of various economic policies on the whole of society and on specific social groups (by income, number of children, occupation, etc.). It can therefore be used to assist in economic policy decisions.

### **What is it good for?**

Microsimulation allows the way elements of the tax, benefits and contributions systems interact to be incorporated into the calculations. It allows the distribution- related impacts of tax regimes and reform proposals to be assessed, without the changes actually having to be introduced. An impact assessment can be prepared using analysis of one or two versions:

- ex-post analysis of measures already introduced;
- preliminary impact assessment of tax and benefits policy: assessment of the redistributory impacts of a reform proposal, its comparison with the existing situation, or comparison of the consequences of two reform proposals;
- assessment of the combined effects of several measures.

### **TÁRSZIM, the microsimulation model of the MoF**

TÁRSZIM is a model containing basic data that describe Hungarian society and the parameters and features of the Hungarian tax and benefits regime. The MoF commissioned the model. It allows analysis of redistribution according to the following variables:

- at individual or household level;
- by income groups (deciles);
- by demographic/household features, such as the age of the individual or the head of the household, his/her economic activity, level of education, occupation, the number of children in the household, or the size of the household;
- by other variables, such as region, type of

municipality, etc.;

- by certain features of special importance from the perspective of social policy that result in an increased risk of poverty (e.g. unemployment).

**The redistributory effects of the tax system applied in 2004**

The 2004 Hungarian system of taxes and benefits involves a range of factors with a host of different, sometimes conflicting effects. Tax allowances account for a substantial amount of money, but they are not really available to those most in need: rather, they benefit medium-income groups. By contrast, central assistance is granted primarily to the poorest third of households, resulting in a substantial increase in their disposable income. This system is highly efficient in reaching families with children, and the importance of such benefits grows with the number of children.

**Change between 2002 and 2004**

On the whole, the changes introduced between 2002 and 2004 favoured the poorer groups of society and families with children. Although the amount of central benefits granted to individuals/households in the top 20% income bracket grew, this was offset by the increase in their tax liability. The principle of solidarity came to be applied increasingly effectively in income redistribution policy, and income disparities were reduced slightly.

**Impacts of hypothetical reforms**

Simplification of the tax system – as occurred in Slovakia, for example – with the rates of the personal income tax (PIT) and VAT set at 19% across the board, would benefit primarily the higher-income groups. Scrapping the tax allowances applied in 2004 and introducing a general social minimum would, on the other hand, favour the poorest groups, and especially households with children.

## 1. Introduction<sup>1</sup>

A thorough knowledge of social income distribution is indispensable for the effective application of instruments of social policy. The aggregated measures of income distribution most frequently applied in Hungary are related to the size of the state – e.g. the proportion of tax revenue to GDP, budgetary expenditure relative to GDP – but these do not describe income inequalities within society. Other indicators that specifically measure income inequalities, such as the Lorenz curve or the Gini coefficient, are likewise inadequate, since they enable only limited assessment of the relative status of the various social groups.

Increasing or decreasing the rate of redistribution may also be an economic policy goal. In essence, the question is which of the competing concepts of social justice should be chosen by the state. Possible targets include alleviation, in general, of inequality in income and quality of life, or focusing assistance on those most in need. Pragmatically, this means that a decision has to be made about the extent to which the citizens of various income levels should contribute to the public purse, and what proportion of income the state should take from the rich and give to the poor in order to enable all citizens to have a decent standard of living, and yet avoid having anybody feel that they must bear an unfairly large burden. There will be arguments in support both of increasing and of decreasing the ratio of reallocation, and consequently the decision to be made will depend on a political values judgment. Knowledge of the ins and outs of income redistribution is, nevertheless, an indispensable prerequisite in evaluating the extent to which the goals are attained.

Income redistribution in this country will be presented in this study using the technique of microsimulation, a method not used before in Hungary. As well as outlining the method itself, using this value-neutral method we will try to measure the extent to which the political values choice has been achieved and the political goals set have been attained.

Since the elements of the tax and benefits system may have conflicting impacts, an assessment of redistribution in terms of the *system as a whole* is much more important than a separate analysis of the various types of taxes and benefits. The state has a variety of instruments available to tackle redistribution. One pillar is the system of taxes, which may be regressive, linear or progressive. Most tax systems are progressive but the various tax allowances will substantially alter the degree of progressiveness, and this is further complicated by indirect taxes. Another such modifying factor is the system of social benefits, which may consist of universal or of means-tested allowances. Universal benefits support the linearity of the system, while means-tested benefits contribute to its progressiveness.

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<sup>1</sup> The authors extend their thanks to Professor John Hills of the London School of Economics, and Director of the Centre for Analysis of Social Exclusion, for accepting our invitation and for his contribution – through his presentation at the Ministry of Finance on the experience relating to application of the model in England – to the success of development efforts in Hungary. Our thanks are also extended to Ms. Holly Sutherland, Director of the Microsimulation Unit, as well as to the staff of HM Treasury, for their kind assistance in sharing their experience with us.

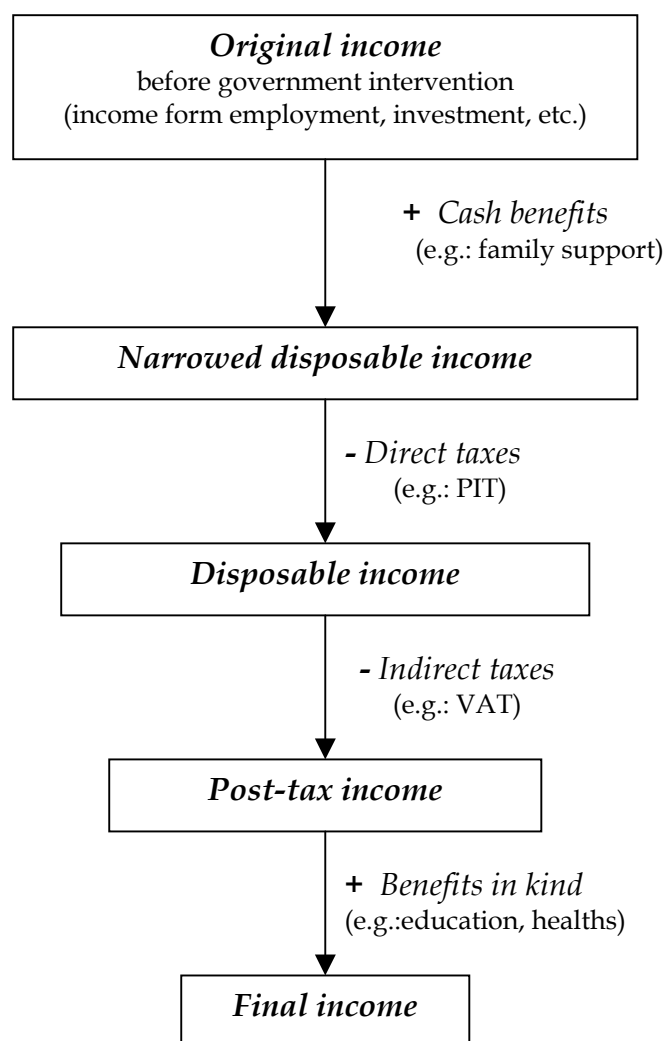
Microsimulation models are applied increasingly widely in debates over these and similar questions, for such models enable analysis of the combined effects of economic and social policy instruments, as applied in a society. Instead of comparing aggregated figures and analysing 'typical' households, this instrument provides a complete picture of the situation facing the various income groups. Furthermore, it enables further analyses according to different categories. For example, the technique is suitable for comparing the income of people in different regions, and in assessing the income positions of underprivileged social groups or sections of society that are characterised by different criteria, such as the unemployed, pensioners or large families. This approach may also help answer such questions as whether a given amount that is intended to benefit children is more effective in the form of a tax allowance or as direct aid.

Distinguishing between the individual and household level is a fundamental aspect of the micro-level analysis of redistribution, for this has a substantial effect on the impacts of redistribution. For instance, a large proportion of consumption data may be meaningfully assessed at the household level, and the tax and benefits system may also have elements that focus on the household (e.g. gas price subsidy). Considering households as the unit of analysis may, however, also be misleading, for in this case large households may seem to be more affluent – according to total income – than is indicated by the actual income position of their members. On the other hand, simple division of the household income by the number of members could also give a misleading result, because, for instance, a child may have substantially different needs in terms of consumption than an adult. One solution to this is offered by the so-called equivalence scales, which assign different weights to the various members of the household. Thus, the incomes of households of different sizes are rendered comparable using the equivalence scale technique. Since the use of any one of the units of analysis may, depending on the question in hand, be a good solution, throughout this study the units constituting the basis of the calculations will be noted as appropriate.

Another choice to be made is that of the income categories, according to which redistribution should be analysed. Figure 1 shows the relationships between the various categories.

The category 'narrowed disposable income' in the figure is usually referred to as gross income, while the category 'post-tax income' is called net income. However, the study also contains calculations that refer to the gross and net incomes of *taxpayers* (that is, income categories that relate to personal income tax returns). Since these use the terms 'gross' and 'net' in a sense somewhat different from that described here, we will apply the terms presented in the figure in an effort to avoid misunderstanding and to make our study easier to follow.

Figure 1. *Income levels*<sup>2</sup>



In this study, we will first outline the advantages and potential disadvantages of using microsimulation models.<sup>3</sup> This will be followed by a look at the way microsimulation is applied in the UK. Then comes a brief description of the microsimulation model 'TÁRSZIM' applied by the Hungarian Ministry of Finance. This is used to analyse the Hungarian tax and benefits system and its development between 2002 and 2004. Finally, based on two hypothetical tax systems, we will show how the model can be used to evaluate economic policy reform proposals, and to make the enforcement of the criteria of decision making easier.

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<sup>2</sup> Based on C. Lankin (2002) and O. Lelkes (2002).

<sup>3</sup> The aforementioned presentation delivered by Professor John Hills is used in this sub-section. John Hills (London School of Economics): The use of tax-benefit microsimulation models, presentation, Ministry of Finance, Budapest, 12 September 2003.

## 2. Microsimulation in the assessment of the tax and benefits systems

### *What is microsimulation?*

*Microsimulation is a technique used to assess the effects of various economic policy measures, relying on data on households or individuals.* For the micro-economic effects of economic incentives (e.g. taxes) are just as important as the macroeconomic factors relating to taxation. *The goal of microsimulation is to show the impacts of the various policies on the whole of society.* In impact assessments calculations are generally produced only for two or three 'typical' groups, for example for the poorest 10% of society, or families with two children. By contrast, microsimulation enables the production of impact assessments that cover all major demographic groups.

One of the key elements of microsimulation modelling is the *database*, which provides a good description of how society is made up and the characteristics of its members, while another element comprises the *system of rules governing taxes, contributions and benefits*.

Microsimulation is a tool that is widely used in many European countries, for in-depth knowledge of the micro-data of the various countries and the possibility of modelling such data is of growing importance in the European debates on issues of social security and taxation, as well as in the harmonisation of fiscal policies.

### *The advantages of microsimulation*

Representativeness. The examples considered to be typical that are often used in impact assessments may lead to misleading results. For example, the 'typical' family, a frequent basis for analyses of the effects of taxes (working father, home-making mother with no private income, two supported children), actually makes up a small percentage of society, and as such cannot be regarded as typical. Microsimulation helps avoid such mistakes.

Modelling of ripple effects. Microsimulation allows the way the systems of tax, contributions and subsidies interact to be reflected in the calculations. Thus, in assessing the impact of a pension increase, account needs to be taken of the fact that the increase in the pension may entail a decrease in other benefits, as a consequence of which the net increase may fall short of the planned level. Such relationships tend to be highly complex, and therefore it is difficult to produce complete calculations for them. A well-structured microsimulation model can, however, take even such interactions into account in the calculations.

'What if...' Microsimulation enables a variety of possible measures to be assessed without the need actually to implement the changes, i.e. this technique answers 'what if' questions. Without microsimulation the only way to assess the impacts would be to actually introduce all the modifications, which – besides being politically impossible – would also entail enormous cost.



Transparency. Finally, one great advantage of microsimulation may be the 'democratisation' of budgetary issues, which renders them accessible and understandable by all. As a matter of course, this depends primarily on the accessibility to the public of the basic data, and on the structure of the model, but it ought to be mentioned that one of the first microsimulation models, the Cambridge example, was aimed in essence at providing political parties, lobby groups and researchers with proper calculations on the impacts of the measures to be taken by the Treasury.

### *Possible disadvantages of microsimulation*

Cost. While it is fairly inexpensive to use the microsimulation model, and to perform the calculations, the setting up and maintenance of the model (primarily the annual updating) do require substantial resources. Although updating of data is not necessarily required for short-term calculations, in assessing long-term impacts the changing characteristics of the population cannot be disregarded, and consequently regular updating of the data is essential. In the case of short-term calculations, the changes can usually be dealt with by having the original data altered in accordance with assumed changes, but this method leads to erroneous calculations over a longer period. For instance, let us assume that unemployment drops from 8% to 7.5%. In the case of a short-term analysis it may be assumed that the group of unemployed people making up that 7.5% is the same as the group that used to make up 8%, if this is supported by other data (e.g. population growth, etc.). Over a longer period, however, this would not be a sound assumption. For example, one cannot use 1990 data to model the 2003 state of the population. Over such a time span there is definitely a need to update the entire database. An additional difficulty is that the effects of changes are valid with respect to the future, but the database contains past data. Consequently there is a need for projections.

Shortage of data. Due care needs to be taken when compiling the database that will constitute the basis of the microsimulation model, since non-representative data (if the group of respondents does not correspond to the composition of the entire population, or if some groups give untrue answers to questions) will lead to distorted results. A database may contain insufficient data or a time series that is not long enough for an impact assessment. For example, to answer questions concerning pensions we need information on the entire working life of the individual – 40 to 50 years – but no data are available for such a long period of time.

Testability. The results of microsimulation are, by their very nature, difficult to control, for many versions may be simulated but only one can actually be implemented. Since microsimulation programmes usually operate with a very large number of input variables, it is difficult to produce separate simulations for each combination of all possible values of a given variable. Consequently, if a calculation gives a result that is different from the actual data, it is difficult to check whether the model is wrong or the difference has been caused by a measurement error in the input data.

Treatment of the results. Users tend to accept the results uncritically, for ‘if it comes from a complicated computer programme, it must be right’. The truth is, however, that models are set up on the basis of numerous assumptions, as a consequence of which the results of the calculations may be wrong.

The deficiencies of microsimulation may be illustrated by the following quotation from a statement by the Cabinet Office of the United Kingdom in 2000, concerning PENSIM, which is a pension scheme simulation model:

[It] took 7 years to get operational after external contractors delivered a model whose workings were unclear to departmental analyses. The model is based on survey data now 10 years out of date, does not model all sources of pensioner income and has difficulty in producing sensitivity analyses.<sup>4</sup>

### *Application of microsimulation*

Testing of alternatives. Microsimulation allows comparison of the consequences of various political decision-making alternatives.

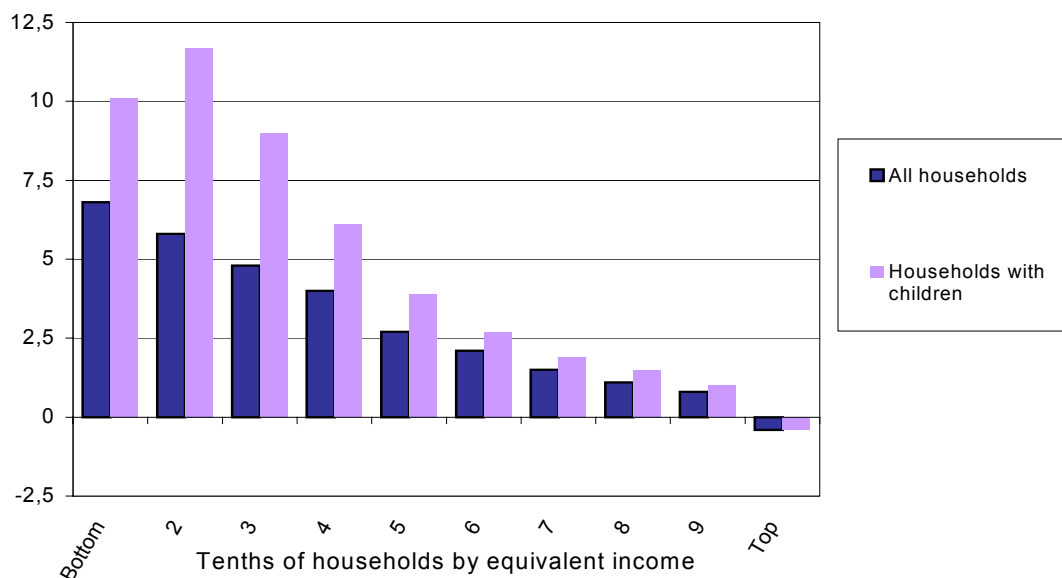
Time span. Microsimulation may be the only means of finding answers to certain questions prior to decision making, for only microsimulation enables the effects to be quantified across the whole of the life cycle. For instance, this is the only way to calculate the effects of the present taxation and benefits policy, and of any reform, on the whole of the life of an individual.

Examples of the use of the technique. Figure 2 shows the effects of the tax and benefits reform introduced by the Blair government. The reform clearly has a highly progressive effect: the least affluent groups of households clearly stand to win, while the more affluent deciles stand to lose. Furthermore, it is also clear that the impact of the reform has been particularly positive on households with children. This is also good because it coincides with the political striving of the Blair government to reduce child poverty. Accordingly, microsimulation has, in this case, made it possible to compare the effects of a reform package introduced four years ago, against the situation that prevailed before the reform.

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<sup>4</sup> Cabinet Office Performance and Innovation Unit (2000).

Figure 2. Impact of UK budgets 1997–2000 (compared to statutory indexation)  
Gain/loss (% of income), 2000 prices

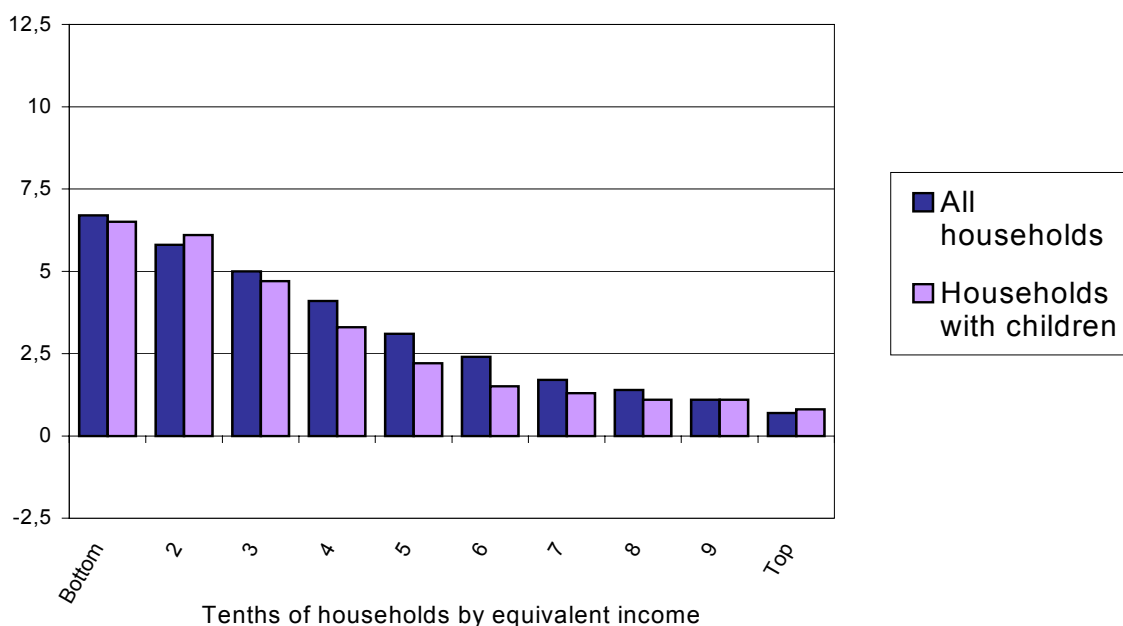


Source: Microsimulation Unit, Essex University.

Figure 3 shows the result of a 'what if' type of assessment. One can see how the situation of households would have developed, had taxes and benefits been increased in line with the growth of incomes, rather than according to the Blair cabinet reform. Clearly, this scenario would have had effects similar to those of the reform.

Figure 3. Impact of uprating taxes and benefits in line with incomes 1997–2000 (compared to statutory indexation)

Gain/loss (% of income), 2000–01 prices

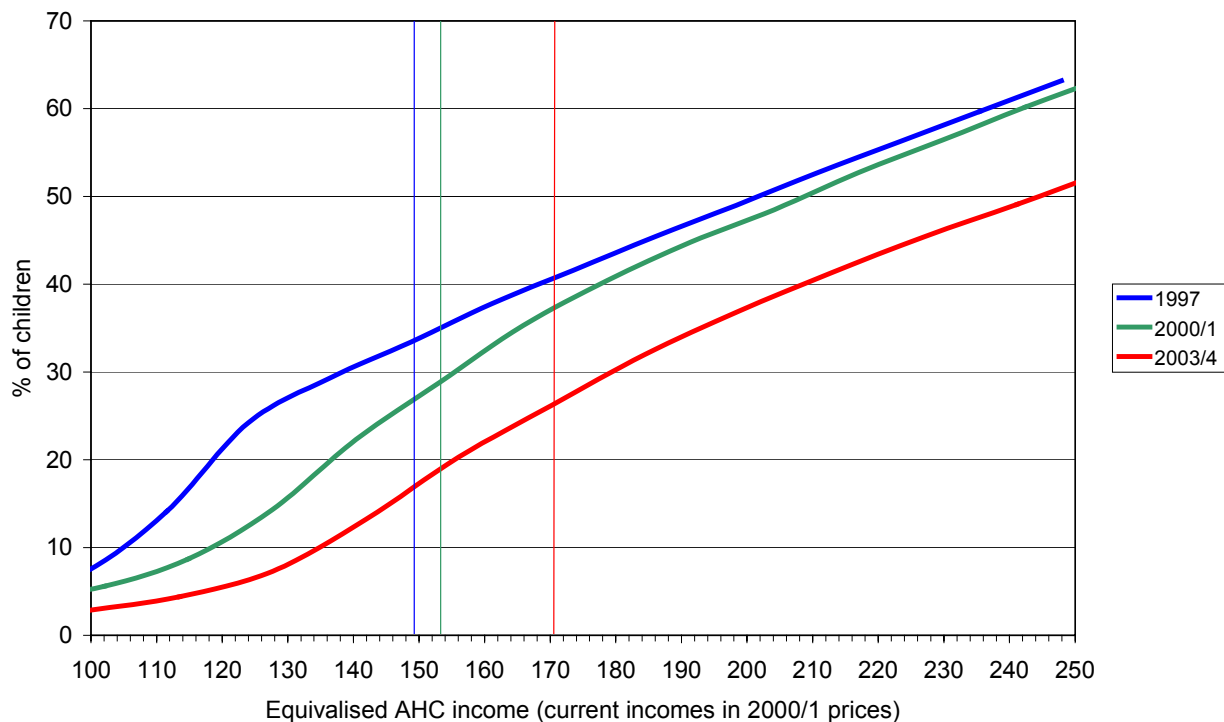


Source: Microsimulation Unit, Essex University.

Figure 4 shows the income position of children in three different years. The vertical line indicates the relative poverty line in each year, set at 60% of median income. The curves show the accumulated ratio of children below the various income levels. For example, in 1997 some 33% of children lived below the poverty line, set at £150 (2000/1 values). By 2000/1 the poverty line had increased somewhat – to £153 – and the percentage of children living below that line had decreased slightly, to 29–30%. By 2003/4 the situation had improved further, both through a substantial rise in the poverty line (approx. £171 at 2000/1 values), and through a decrease in the percentage of children living in relative poverty, to about 26%.

The data for years 1997 and 2000/1 are actual figures, while those for 2003/4 are based on an estimate. Since the most recent actual data released usually refer to a period some 18 months previous, microsimulation is required for the calculation of current data.

Figure 4. Cumulative proportions of children in households by income (after housing costs), under the UK policy regimes of 1997, 2000/1 and 2003/4 (compared to a relative poverty line of 60% of median income)



Source: Microsimulation Unit, Essex University.

### *The types of microsimulation modes*

Microsimulation models fall into three basic categories: static, dynamic population and dynamic cohort models.

Static models. This type is used to simulate the effects of policy changes, with respect to cross-sectional data. Depending on the assumptions made, this model type is suitable for the assessment of effects on and changes in behaviour. For example, basic types assume labour supply or the propensity to save to be constant while tax rates change, which is not correct in the case of long-term calculations. It may be acceptable for short-term calculations, but even then it will lead to errors if the changes in the system are substantial. Perhaps an even bigger error would be produced if the system took some behavioural effects into account while ignoring others; for instance, if it took account of the effects of the change in tax rates on labour supply, without taking into account changes in the readiness to have children, etc. Care needs to be taken to formulate the questions precisely if static models are used, because otherwise, if the above-mentioned basic characteristics are not properly taken into consideration, they will often result in findings that make no sense. For example, let us assume a substantial reduction in the tax on savings interest. If we use the old regime to calculate the revenue generated, it will make no

sense, since the reduction in the tax on interest will probably have triggered additional savings that were not present in the previous system. In this case, the answer does not make sense because the question was framed wrongly.

Examples of static models include POLIMOD (Essex), the IFS<sup>5</sup> model (TAXBEN) and EUROMOD (Essex).

Dynamic population models. This type of model is used to predict future characteristics of society. This is essential in the case of calculations concerning pensions, for example. Accordingly, dynamic population models will calculate the expected development of the pension system based on the present distribution of incomes, simulating changes in the existing population.

Examples of dynamic population models include PENSIM (a model developed by the Department of Work and Pensions (DWP) to examine the future development of pensions), PSSRU long-term care and the LSE SAGE project.

Dynamic cohort models. This type relies more on hypotheses, performing calculations concerning the life cycles of hypothetical cohorts. From the point of view of political decisions, the first two types of model are probably more important.

An example of a dynamic cohort model is LIFEMOD.

### **3. Microsimulation models in the United Kingdom**

It is increasingly widely recognised that, alongside the macro-effects of redistribution systems, micro-level features of economic incentives also play a substantial role. In-depth knowledge of the micro-data of the economy – and the possibility of modelling them – are essential to discussion of issues of social security and taxation. This applies particularly to the European level, where a certain measure of harmonisation of the redistribution systems is a common goal. It is not surprising, therefore, that an increasing number of countries are using microsimulation models to analyse the impacts of economic policy proposals. The United Kingdom, however, stands out even among the European countries, in that it has four organisations engaged in microsimulation modelling, including two government agencies (HM Treasury with its IGOTM model, and the Department for Work and Pensions with PSM), a university research institute (University of Essex Institute for Social and Economic Research, Microsimulation Unit:<sup>6</sup> POLIMOD), and an independent research institute (Institute for Fiscal Studies: TAXBEN).

IGOTM, the model of HM Treasury. The IGOTM model has been produced, and is maintained, by the section of HM Treasury in charge of analysing labour market incentive effects and poverty. As well as assessing the macro-effects of

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<sup>5</sup> Institute for Fiscal Studies (London).

<sup>6</sup> The Microsimulation Unit used to belong to Cambridge University.

economic policy proposals, they use this model to regularly analyse the micro-level income redistributory effects of the tax and benefits system. The most frequently analysed questions include the groups of society and numbers of people considered to be winners/losers, what types of household are most heavily affected, how income distribution within society is changing, how child poverty is changing, and how the marginal tax rates – the most important factors in labour market incentives – are changing. Furthermore, all analyses include the total costing for a given reform proposal to be borne by the central budget. The analyses produced by the group play a paramount role in the preparation of decisions, and each year the relevant chapter of the budget contains those analyses.

As has already been mentioned, IGOTM is a static microsimulation model, i.e. one that does not take into account the behavioural responses of society to changes in the calculations. In 2001, however, work began on developing a dynamic version of the model. The first results have been produced, but the Treasury, together with the Department for Work and Pensions and the Institute for Fiscal Studies, are still working on refining the model.

POLIMOD<sup>7</sup>. Microsimulation modelling is carried out at numerous places in the United Kingdom outside government. Two of the most important organisations engaged in such work are the Microsimulation Unit of Essex University and the Institute for Fiscal Studies. The POLIMOD model, used by Essex University, has been developed as a user-friendly product, to make it accessible to a broad range of users. In terms of its functions, it is very similar to IGOTM, i.e. this model is suitable for micro-level impact analysis of economic policy reform proposals and for the comparison of different alternatives, but it is also a basis for numerous economic analyses. Work is also continuing on POLIMOD to make it more dynamic and suitable for the analysis of behavioural responses.

EUROMOD. This is another major microsimulation project involving the Microsimulation Unit of Essex University. EUROMOD is an integrated microsimulation model of the EU-15, developed with EU funding, under the coordination of Essex University. The model allows for EU level studies and comparative analyses. Some of the analyses relating to the EU social policy objectives are also produced with the aid of EUROMOD. An improved version of EUROMOD will involve the ten new member states, including Hungary.

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<sup>7</sup> For further information on the model and analyses produced using the model see the Microsimulation Unit, Essex University web page:  
<http://www.iser.essex.ac.uk/msu/>

#### 4. The TÁRSZIM microsimulation model of the Hungarian Ministry of Finance

Microsimulation modelling has not so far been used in Hungary to prepare economic policy decisions. Despite some earlier initiatives,<sup>8</sup> the programme called TÁRSZIM, recently launched by the Ministry of Finance, involves the introduction of microsimulation in economic policy in Hungary. The development of this model by the TÁRKI social research institute was commissioned by the Ministry of Finance, and the model is as much in line with the Ministry's requirements as possible. Within the Ministry, the departments in charge of tax and benefit policies have also contributed to the development effort coordinated by the Economic Research Department, ensuring integration of the requirements of the various functional areas even before construction of the model begins.

What is included in the model? Key parameters describing the tax and benefits system can be set within the microsimulation model,<sup>9</sup> including:

- personal income tax (PIT);
- all tax allowances included in the personal income tax return;
- indirect taxes (VAT);
- parameters of the main forms of benefit offered by central government, including eligibility and disbursement criteria.

It should be noted that the model explores the redistributory effects of *only* the tax and benefits system. It does not analyse the effects of the general government system as a whole, i.e. it does not take account of the consumption of public goods or benefits in kind, such as health care or education. Furthermore, the so-called *central benefits* that can be set in the system include only family allowance, child care aid, maternity benefit and the gas price subsidy.

What is it good for? Impact assessments can be carried out by analysing one or two versions describing tax regimes:

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<sup>8</sup> Literature on previous microsimulation modelling in Hungary is presented on the relevant web page of TÁRKI:

<http://www.tarki.hu/research/mikro/index.html>

<sup>9</sup> In the course of simulations, the model is capable of handling the following parameters of the tax and benefits system:

- all income items included in the PIT return (i.e. categories of income to be aggregated, and the categories of income taxed separately);
- all tax allowances included in the PIT return (including employee tax allowance, supplementary tax credit and family tax allowance);
- certain parameters of pension and unemployment benefits;
- only those benefits given by central government;
- new benefits set by the user;
- car registration fee;
- indirect taxes (VAT, duty) by main product group;
- parameters of social security contribution payments.



- ex-post impact assessment of actual measures;
- preliminary impact assessment of tax and benefit policy: assessment of the redistributory impacts of a reform proposal, its comparison with the existing situation, or comparison of the consequences of two reform proposals;
- assessment of the combined effects of several measures.

*The unit of impact assessment may be:*

- individual level, concerning a group of taxpayers or the entire population;
- household level, with respect to the entire population.

This is important for, in the case of certain variables such as change in net income, the taxpayer (the individual) is the self-evident unit of analysis, while in other cases, such as taxes on consumption, it is the household.

*Impact assessment may be carried out using several variables:*

- by income groups (deciles);
- by demographic or household features, such as the age of the individual or the head of the household, his/her economic activity, level of education, occupation, the number of children in the household, or the size of the household;
- by other variables, such as region, type of municipality, etc.
- by certain features of special importance from the perspective of social policy that result in an increased risk of poverty (e.g. unemployment).

What is it not suitable for? TÁRSZIM is a static model, i.e. it is suitable for assessing the effects of small-scale changes and of short-term adaptation, but it is *not* suitable for assessing *behavioural responses in the area of labour market activity, and only to a very limited extent is it capable of assessing changes in consumption patterns.*

The features – number of elements, information content – of the data sets contained in the model determine how it can be utilised, and therefore:

- the model is not suitable for assessing the impacts of specific measures that influence only a limited segment of society;
- benefits and allowances granted by local authorities cannot be simulated, for there are not sufficient data concerning the eligibility criteria for such benefits.<sup>10</sup>

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<sup>10</sup>The initial database contains all social and family supports among the income items, but since it is not possible to simulate social transfers from local government, the simulation of benefits is limited to the range of those granted centrally. In the calculation of income, however, local items are taken into account.

The data used by the model. Since there is no database containing income, taxation, consumption and household information available in Hungary, the database of the model has been built up of three different databases.<sup>11</sup> The database relies primarily on the 2003 TÁRKI Monitor data, which contains the individual demographic and labour market features and income data from 2,334 households and their members for 2002, along with the key features of those households. This is supplemented by the 2001 database of the CSO (Central Statistics Office) Household Budget Survey, adjusted to the 2002 level, which includes detailed consumption data for almost 10,000 households. The third database is a random sample of almost 33,500 elements, compiled by APEH (the Tax and Financial Control Administration), from data from the 2002 personal income tax returns.

Accordingly, the version constituting the basis of the model – that is, the sample describing Hungarian society – contains data from 2002. For analyses that relate to any year other than 2002 the basic settings need to be adjusted. The multipliers adjust for the differences between the original database and the modelled period, and need to be separately set for the various income types and for the consumption and benefit data. The multipliers used for the 2004 version presented in this study are forecasts produced by the Ministry of Finance concerning nominal growth between 2002 and 2004 (except for the data on consumption), while the multipliers applied to data on consumption are based on CSO data.

The VAT data contained in the model are somewhat distorted by two factors:

(1) *Distortion stemming from the methodology.* The model contains data on consumption – not on VAT. The VAT data are calculated from the data on consumption, assuming that the consumer has paid the correct amount of VAT on each HUF spent on consumption. This, however, is not necessarily true, for it is not known whether a given product or service was consumed in the white or the ‘black’ sector, i.e. no information is available on whether the consumer actually paid VAT.

(2) *Distortion stemming from the original database.* The data on consumption originate from the CSO Household Budget Survey, and in this type of data capture exercise higher- income individuals will more often refuse to answer questions and conceal incomes. For this reason, the sample contains a smaller number of high-income, and a higher proportion of lower-income households than there are in reality (KSH, 2004: p. 29). According to the methodology publication of the CSO, the resulting distortions include (KSH, 2004):

- “In the upper section of the income range, each income bracket of the sample consists of fewer households than there are in reality, for some of the high-income households are not included in the sample. Thus...it is possible that the indicators of the top tenth of the population according to the sample are actually more characteristic of the top fifth of the population. The opposite applies to the bottom regions of the income range.

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<sup>11</sup> A detailed technical description of the compilation of the data file is presented in Appendix 1.

- The sample shows the average figures on income and consumption to be smaller than they actually are.
- One additional consequence is that we cannot establish, to a reasonable level of accuracy, how many people are living on incomes below a specific social policy value. It may, however, be safely stated that it is fewer people than is shown by the sample.”

On the whole, and taking all the distorting factors into consideration, it is assumed that the *VAT revenues are underestimated by the model by some 25%*. Furthermore, the amount of VAT paid by higher-income individuals is underestimated by a higher percentage, and consequently *the actual VAT distribution is somewhat more progressive than is indicated by the study*.

What follows are some examples of the uses of a microsimulation model. First of all we will describe the redistributory effects of the 2004 tax and benefits system; this will be followed by a comparison of the redistributory effects of the 2002 and the 2004 tax regime. Finally, a hypothetical tax regime will be used to describe how the microsimulation model can be applied to analyse the reform proposals.<sup>12</sup>

## 5. Who benefits from the 2004 tax regime?

### *The parameters of the tax and benefits system*

- In 2004 a three-tier personal income tax regime has been in effect, with the following tax rates:
 

HUF 0 – 800,000	18%
HUF 800,000 – 1,500,000	26%
HUF 1,500,000 –	38%
- separately taxed incomes are subject to 10%, 20%, 27% or 35% tax rates;
- there is an employee tax credit, and a supplementary tax credit ensures people on the minimum wage are tax exempt;
- the family tax allowance may be shared between family members;
- there is a motor vehicle registration fee;
- the normal VAT rate is 25%, with a preferential rate of 15%. Certain products and services are subject to an even lower VAT rate;
- excise duty is levied on alcoholic beverages, tobacco products and fuel;
- the rates of pension contributions, health insurance contributions and the solidarity fund contribution are 8.5%, 4% and 1%, respectively.

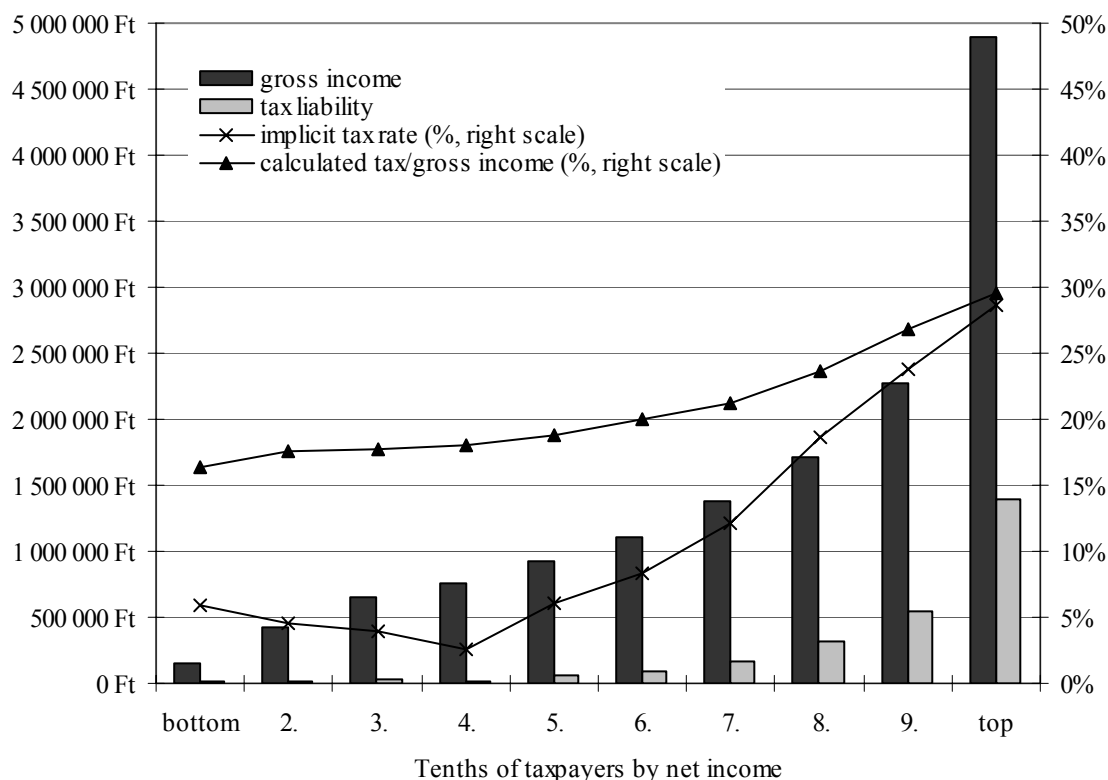
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<sup>12</sup> The figures presented in the following sub-sections contain results of calculations produced using the TÁRSZIM model.

### *The redistributory effect of the tax system*

First of all we assessed the amount of tax paid by the various income groups of taxpayers in absolute terms and as a percentage of gross income. In Figure 5 the per capita gross income and tax liability are arranged by net income, along with the implicit tax rate calculated as a ratio of the two. Although the *tax liability* increases as the net income grows, the *implicit tax rate* still diminishes at the beginning of the distribution. The reason for this is that those in the lowest decile income group can exploit the tax allowances to a lesser degree than those in a somewhat better income position. The figure also shows the income redistribution effect of the tax allowances on the various taxpayers. The curve of the ratio of calculated tax to gross income shows the rate of tax that *would be* borne by individuals in the various deciles *without the tax allowances*. This varies between 16% and 30% with respect to the various groups, which is more or less in line with the tax scheme. The implicit tax rate, which shows the ratio of *actual tax liability* to gross income – taking tax allowances into account – is much more progressive and is more favourable to the less affluent groups of society: it amounts to 6% in the lowest decile, dropping to 3%, and then gradually rising along with income, until finally, in the top decile, it is up to 30%, which is almost as high as the rate calculated without the tax allowances.

Figure 5. Gross income and tax payment obligation, and the implicit tax rates calculated from them



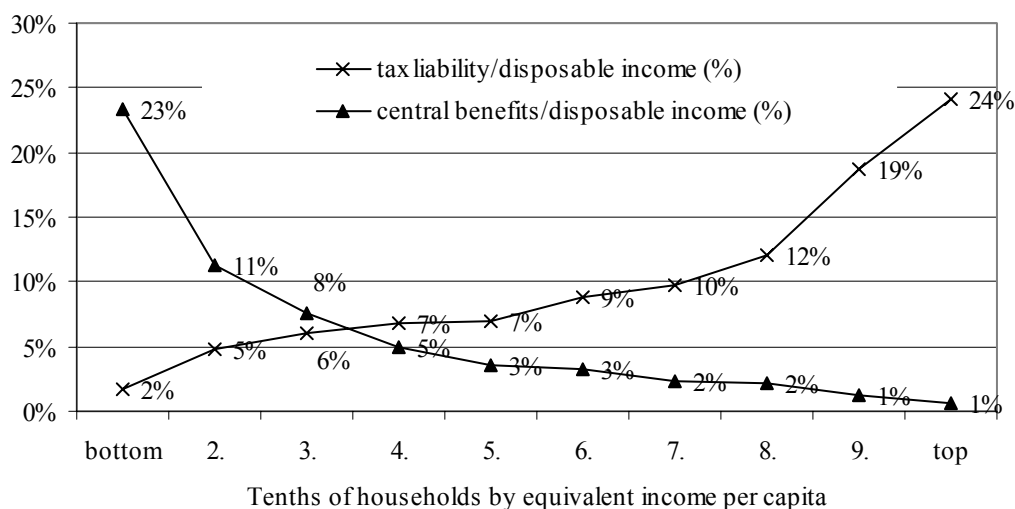
Notes:

implicit tax rate = actual tax liability / gross income;

calculated tax = tax calculated in accordance with the tax schedule on incomes involved in the aggregation + the tax payable on separately taxed incomes.

In the next phase we reviewed the redistributory effects of the tax and benefits system on the *total population* – that is, on *all households*. This category includes – besides taxpayers – children, pensioners, the unemployed and other economically inactive persons. Figure 6 shows the tax liabilities and the central benefits of households (the latter including family allowance, child care aid, maternity benefit and gas price subsidy) as a percentage of disposable income. A substantial measure of redistribution is observed in this category as well: tax payment accounts for a smaller percentage of disposable income in the lowest three income deciles, than do central benefits, i.e. the state collects smaller amounts from the first three deciles in the form of direct taxes than it returns to them in the form of central benefits. From the fourth decile upward, however, households pay more to the budget than they receive in the way of central benefits.

Figure 6. The tax liability of households and the benefits received from central government, as a percentage of disposable income



According to figures over the past few years, the Hungarian budget has been receiving some 10–25% more income from Value Added Tax than from personal income tax.<sup>13</sup> Both tax types are levied on households, though to substantially different degrees in the different income groups, as is shown in Figure 7 and detailed in Table 1. Clearly, while personal income tax is highly progressive, the distribution of VAT is much more even.<sup>14</sup> In the case of VAT, households in the various income deciles make almost equal contributions to the revenues – between 8% and 13%, i.e. VAT results in hardly any rearrangement of the original income distribution. By contrast, only 0.5% of personal income tax (PIT) revenue is paid by households in the lowest income decile, with 47% coming from those in the top decile: clearly, PIT results in a substantial income rearrangement.

<sup>13</sup> Benedek et al. (2004).

<sup>14</sup> However, as was noted in the introduction to the TÁRSZIM model database, this is partly a result of distortions in the database.

Figure 7. Total VAT and PIT liability borne by households in the various income deciles

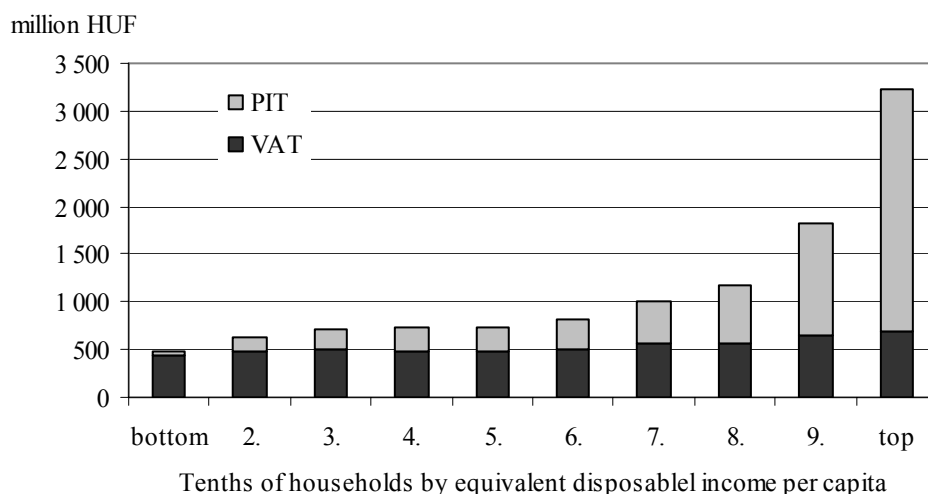


Table 1. Percentage distribution of total VAT and PIT liabilities among the various income deciles

	VAT	PIT
bottom	8.3%	0.5%
2.	9.1%	2.5%
3.	9.2%	3.9%
4.	9.1%	4.4%
5.	9.1%	4.7%
6.	9.2%	6.2%
7.	10.3%	8.2%
8.	10.7%	11.2%
9.	12.1%	21.6%
top	12.8%	47.0%

The Hungarian data correspond to the theoretical propositions. Although, in one of the first articles on this topic, Atkinson and Stiglitz (1976) argued that in an optimum income tax regime<sup>15</sup> – if certain conditions are met with regard to the preferences of consumers – there is no need for indirect taxes (which may reduce the efficiency of the system), it has been shown by several experts (e.g. Saez (2000)) that the information asymmetry between government and individuals still necessitates the application of indirect taxes. Another argument for indirect taxes is poor tax

<sup>15</sup> An optimum tax regime is characterised by the following: as a result of market failures (external effects) the state needs to intervene in market mechanisms by applying taxes, i.e. the state needs to raise tax revenue. An optimum arrangement among the different tax systems is one that entails the smallest distortion or social cost (including primarily 'dead weight loss'). For more details on the subject see: James Alm (1996).

compliance, which precludes an optimum income tax regime. In the case of poor taxpayer morale, it is cheaper and easier to collect indirect taxes. Boadway, Marchand and Pestieau (1994) come to the conclusion that an optimum tax regime comprises a combination of direct and indirect taxes. With indirect taxes, however, for the sake of fairness, higher rates should be imposed on goods consumed more often by higher-income groups of society. This is the rationale, for instance, for applying a lower VAT rate to foodstuffs, on which all income groups spend more or less the same amount of money, than to services, on which the higher-income groups spend more.

As far as the budget is concerned, it makes no difference whether households are granted a tax allowance (which means revenue lost), or, from the taxes collected, an equivalent amount is given back in benefits. There is, however, a substantial difference between the two in terms of the incentive effects and the implicit tax rates, and the administrative costs vary too. There is also a major difference between the two forms of support from the perspective of the target group. A tax allowance will usually fail to reach the lowest-income groups, for the allowance does not benefit anyone who has little or no taxable income. By contrast, a direct benefit which, unlike tax allowances, is not related to income, will reach even the poorest. These considerations are covered in the 2004 government programme. On the one hand, it places special emphasis on the 'means tested principle' in the tax and benefits system, and, on the other hand, it refers to the fact – as a problem to be tackled – that the family tax allowances are available primarily to the higher-income groups of society. The current position is clearly shown in Figure 8, which illustrates the income groups that can use the tax benefits and shows the recipients of the benefits: the tax allowances barely reach the lowest income decile, but these households do receive substantial central benefits. Households in the second income decile can access part of the tax allowances, and they are also reached by benefits. It is clear, however, that those in the top per capita income group benefit most from the tax allowance. Clearly, tax allowances are far less precisely targeted than are direct benefits.<sup>16</sup> Figure 9 shows that the top decile receives almost as much from the tax allowances and the benefits together, as does the lowest.

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<sup>16</sup> It should be noted that tax allowances do not serve social purposes alone. In 2003 almost half of all tax allowances were made up of employee tax credits and supplementary tax credits; 20% were made up of the tax allowance on pension contributions (now terminated); some 13% were family tax allowances; and 6% were allowances on housing loans. The rest of the allowances were aimed at stimulating savings and investment.



Figure 8. Equivalent per capita tax allowance and central benefit, by income decile

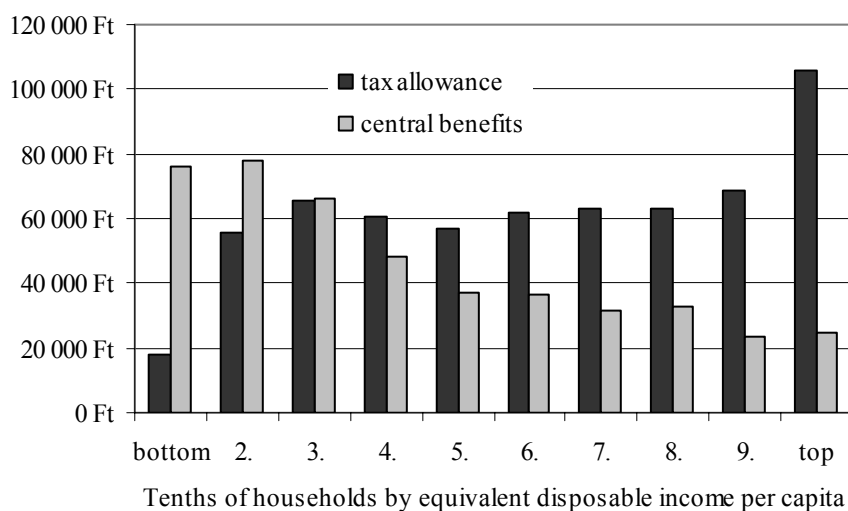
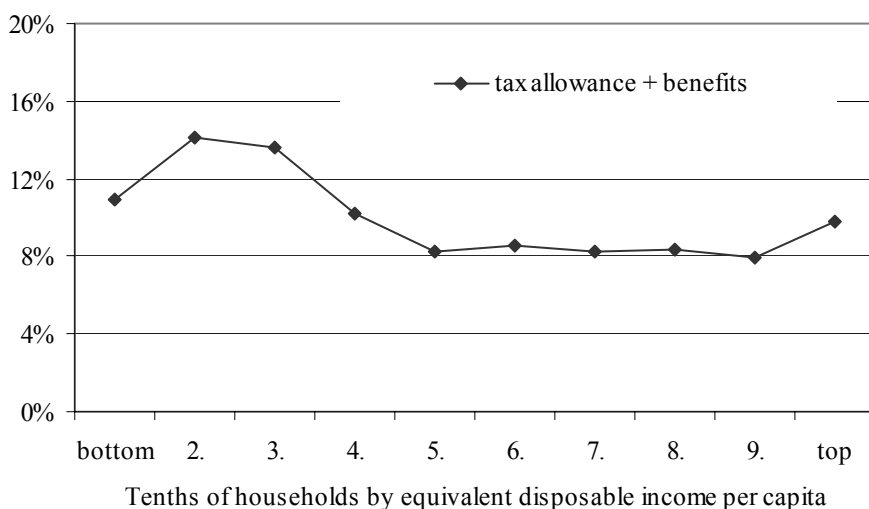
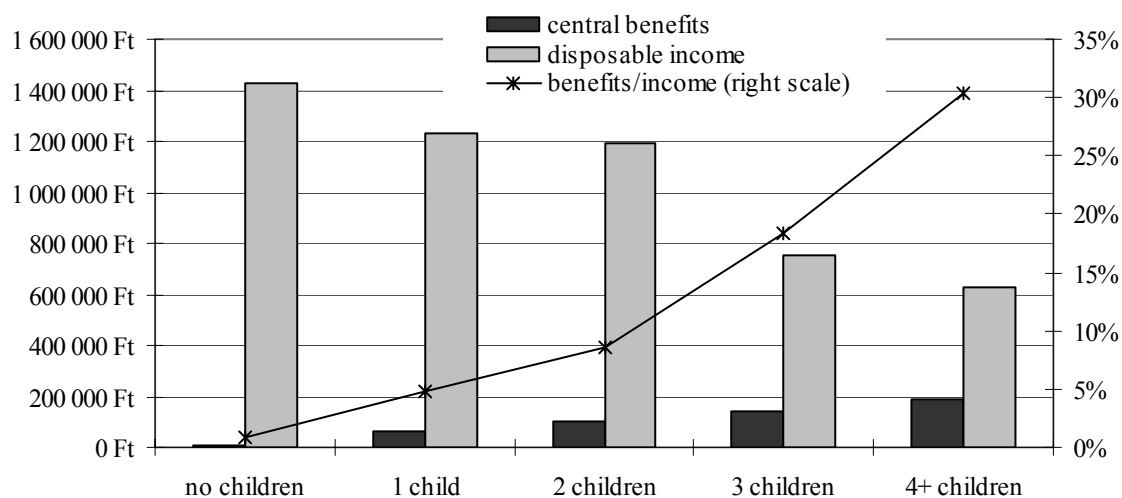


Figure 9. Combined distribution of tax allowances and central benefits within the whole of society, by income decile



Both the 2004 government programme and the Convergence Programme mention that the government intends to improve the lot of *families with children*, i.e. it considers families to be a target group for redistribution, and intends to make a contribution to the cost of raising children. This is justified by the fact that the per capita equivalent disposable income in a family with three children is less than half that of a family with no children. Accordingly, the per capita central benefit increases with the number of children in a family.

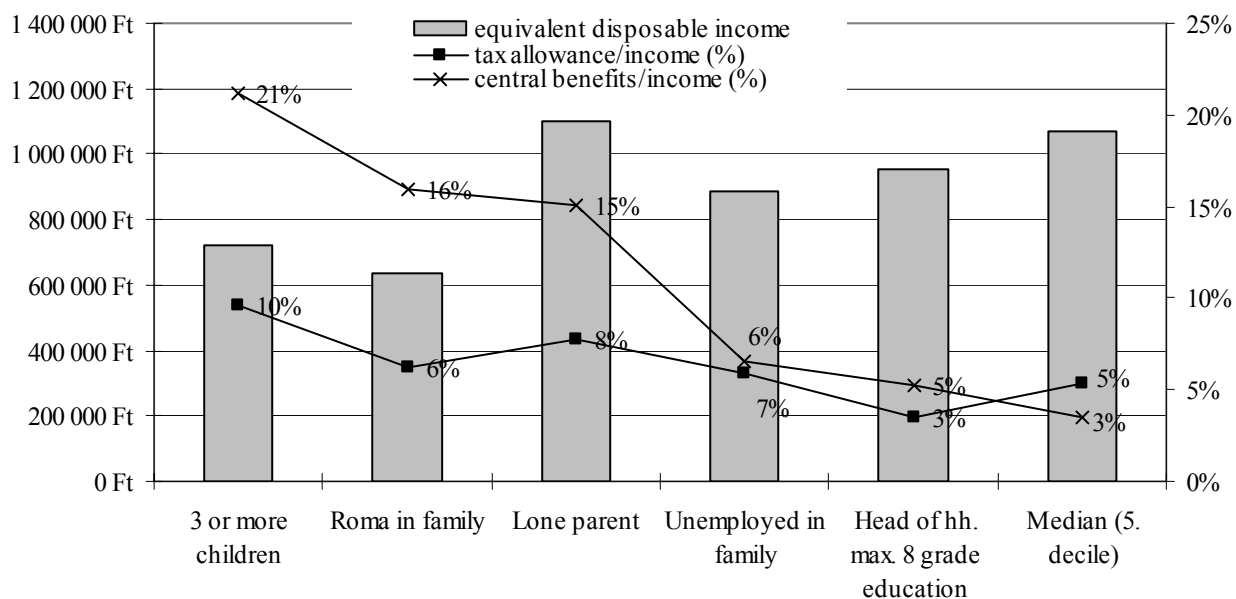
Figure 10. Equivalent per capita average central benefit and disposable income, and their ratios, by number of children



Besides providing assistance to families with children, the government also aims to alleviate *poverty*. Aside from an assessment of income position, analysis of this aspect may be facilitated by investigating households that are more exposed to the risk of poverty on account of some of their characteristics.<sup>17</sup> Families with more than two children receive substantial benefits and tax allowances, in terms both of the amount of such assistance and of its percentage of their disposable income. Benefits make up 23% of their income, which is more or less the same as the ratio observed in the least affluent decile. In single-parent households the tax allowance and benefits are much lower, in terms both of the amount and of the percentage of their income. Central benefits are relatively efficient in reaching households with Roma family members as well. In the case of other vulnerable categories, where there are unemployed family members or where the head of the household is poorly qualified, the percentage of benefits and tax allowances within the total income is much lower.

<sup>17</sup> It should be noted that the categories investigated here are defined by TÁRKI, and are not government-designated groups.

Figure 11. Ratio of central benefits and tax allowances to total income in some types of households particularly vulnerable to the risk of poverty



Thus, a variety of factors, with effects in different directions, are functioning simultaneously in the Hungarian tax and benefits system. Tax allowances account for a substantial amount, yet they fail to reach the groups most in need: they tend to benefit medium-income groups primarily. By contrast, central benefits reach the poorest third of households, making a significant contribution to the disposable incomes of such households. The system is efficient in reaching families with children, and the higher the number of children the more important is the role played by benefits.

## 6. Income inequalities have diminished slightly. Change in income redistribution between 2002 and 2004

### *The changing tax regime*

A three-tier personal income tax regime was in operation both in 2002 and 2004, with different brackets and different rates:

2002			2004		
HUF 0 –	600,000	20%	HUF 0 –	800,000	18%
HUF 600,000 –	1,200,000	30%	HUF 800,000 –	1,500,000	26%
HUF 1,200,000 –		40%	HUF 1,500,000 –		38%

Other differences and similarities of the regimes included:

- the range of separately taxed incomes and the various tax rates remained unchanged (at 10%, 20%, 27% or 35% in both years);

- employee tax credit was available in both years, but the supplementary tax credit – guaranteeing tax exemption for minimum wage earners – was available only in 2004;
- the range of tax allowances was changed somewhat, and the maximum of the allowances available under various headings also changed in some cases. The most important change was the scrapping of the tax allowance on pension contributions;
- the family tax allowance did not change;
- the car registration fee was introduced in 2004;
- the normal VAT rate was 25% in both years; however, the preferential VAT rate was 12% in 2002 and 15% in 2004. Even lower tax rates were levied on certain products and services in both years;
- the range of products on which duty was levied remained unchanged, though the rates increased somewhat between 2002 and 2004;
- the social security contributions changed as follows:

	2002	2004
Pension contribution	8%	8.5%
Health insurance contribution	3%	4%
Solidarity fund contribution	1.5%	1%

- the main changes to the family support system:

	2002	2004
Minimum pension (m. p.)	HUF 20,100	HUF 23,200
Child care aid	1 x m. p.	2 x m. p.
Maternity benefit	1.5 x m. p.	2.25 x m. p.
Family support	Increased for all numbers of children	

- a gas price subsidy was introduced in 2003.

### *The change in redistribution<sup>18</sup>*

Under the 2004 government programme the government aims to reduce inequality of opportunity and to alleviate poverty:

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<sup>18</sup> The comparison between the 2002 and 2004 data is based on nominal values. The income and consumption data in the major categories have been adjusted from 2002 to 2004 using the relevant growth multiplication factors (calculated using MoF expert estimates or CSO data). When income data are involved only the income multipliers are taken into account and the different years have not been adjusted to comparable values. For more information see the description of the TÁRSZIM model in section 4.

One of our priority goals is to eliminate social injustice. Support will be given to those living in dire straits; a helping hand will be given to those who are struggling; the middle class will be strengthened; the opportunities to provide for oneself will be enhanced; and more responsibility will be expected of the more affluent, while their opportunities will be enhanced by reduced taxation.<sup>19</sup>

The incomes of the poorer groups of society increased between 2002 and 2004 rather faster than those of the more affluent. No rearrangement of the share of total income could, however, be achieved.

Figure 12. Per capita disposable income of households, and its change between 2002 and 2004

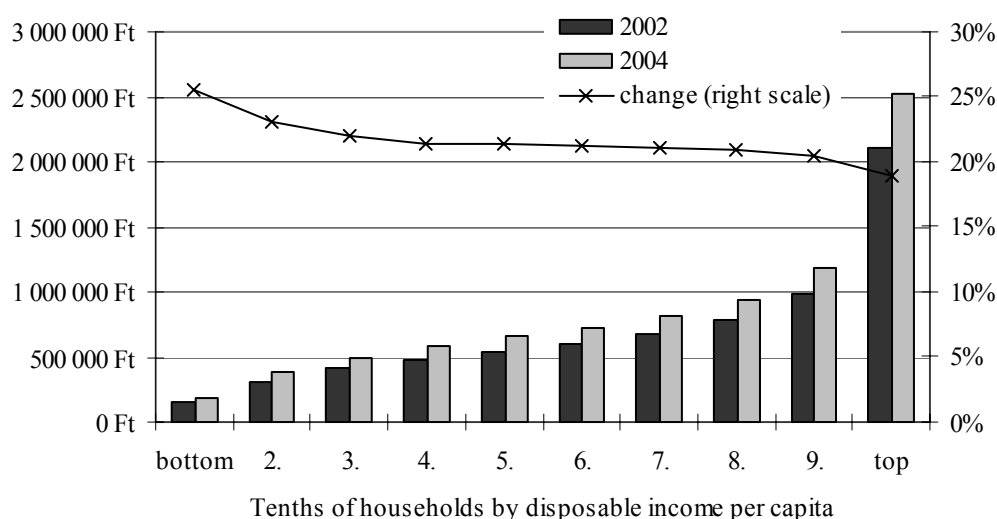
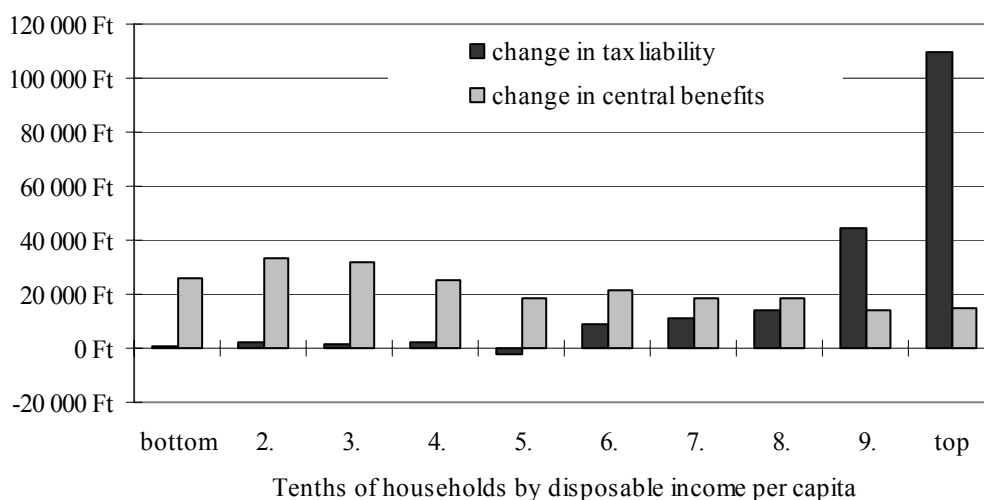


Figure 13 shows the change in tax liability and central benefits between 2002 and 2004. For the top two deciles the growth in tax payment exceeded the growth in benefits, while for the bottom third the increase in benefits far outstripped that of tax payment. Accordingly, the combined effects of tax payment and benefits reduced inequality. At the same time, in terms of amount, it was not the central benefits paid to the two poorest deciles that saw the largest growth.

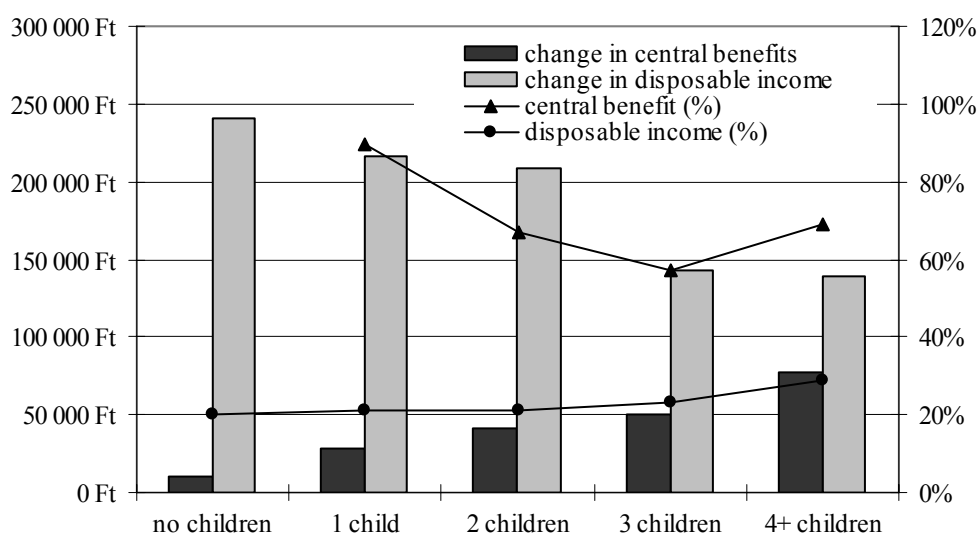
<sup>19</sup> *A New Dynamism for Hungary! The programme of the government of the Republic of Hungary for a free and just Hungary, 2004–2006*, p. 20.

Figure 13. Change in the equivalent per capita tax liability and central benefits received between 2002 and 2004



Under the government programme the per capita central benefit increased by a larger amount in the case of families with more than two children, largely through a rise in the amount of family allowance. At the same time, as a percentage of the benefits disbursed at the beginning of the period, the benefits provided to families without children showed the largest increase. The reason for this was that such households received very small amounts of benefits in 2002, and a gas price subsidy was introduced in 2003 for all households. Overall, the percentage change in disposable income was again highest among families with several children.

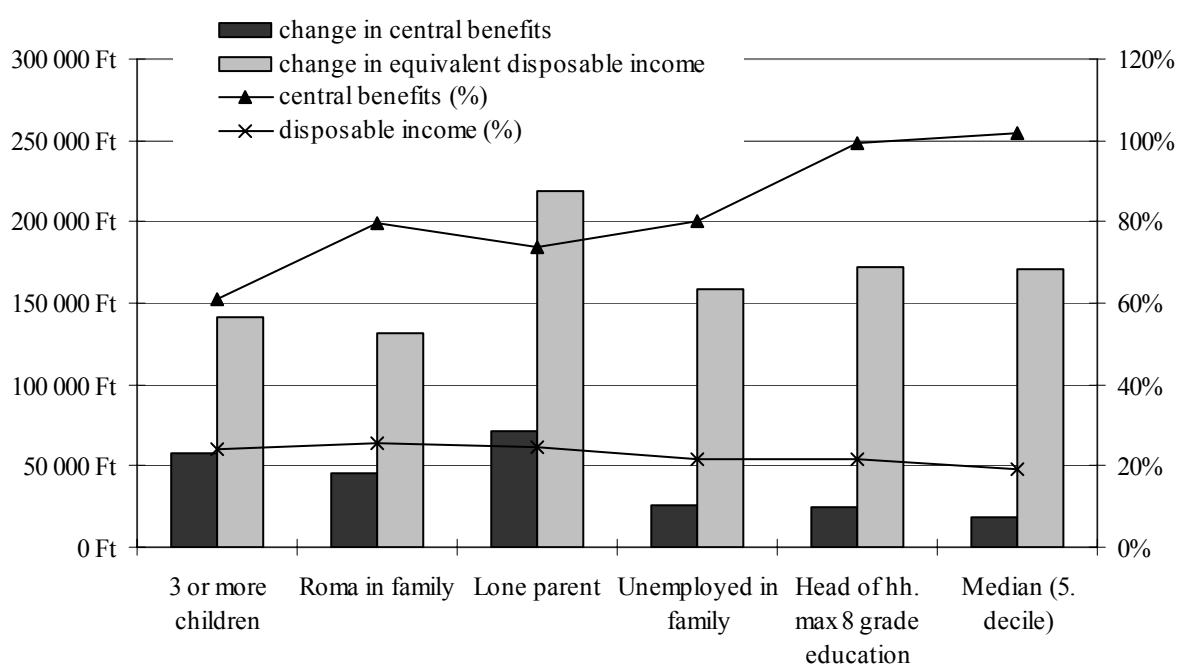
Figure 14. Change in equivalent per capita central benefits and disposable income in terms of amounts and percentage, between 2002 and 2004, by number of children



Note: The series of data showing the percentage growth in central benefits does not include households with no children since, owing to the huge figure in this category – 900% – the rest of the data points would not have been clearly visible.

A substantial increase was observed in the central benefits provided to households facing a high risk of poverty, but in nominal terms their disposable income increased by only 20–26% during the period under review. In terms of amount, the largest increases in central benefits fell to single-parent families and families with more than two children, as well as to those with Roma family members.

Figure 15. Change in equivalent per capita central benefits and disposable income in terms of amount and percentage, between 2002 and 2004, by risk factor



On the whole, the winners between 2002 and 2004 included the poorest social groups and households with children. Though the amount of central benefits increased in the case of the top fifth in income distribution, this was offset by the increase in their tax liability. By and large, the solidarity principle had an increasing impact on the income redistribution policy, and income inequality diminished somewhat.

## 7. Assessment of the impacts of potential tax regime changes

The following is a description of the results of ‘what if’ analyses. The tax regime parameters specified are entirely hypothetical in both cases. First, we will take a tax regime that is somewhat similar to the one introduced in the course of tax reform in Slovakia, which is not as complex as the existing Hungarian system: all the

tax rates (PIT and VAT) have been set at 19%, and there are no tax allowances or central benefits. The second case is also a simplified tax and benefits system. Tax allowances are removed and replaced by benefits governed by income limits.

It should be noted that the budgetary effects of the two tax regimes are not explored, for we only aim to show the possible uses of the technique: we do not aim to present actual tax reform proposals. Yet we mean to present examples that are, on the whole, likely to yield net revenues similar to those of the existing tax regime.

As has already been mentioned, the model used in the analyses does not take account of behavioural responses. Accordingly, in interpreting the following results it should be remembered that the behavioural responses of the economic actors to the various changes would probably modify the outcomes.

### *A single 19% tax rate*

*The parameters of the hypothetical tax system are as follows:*

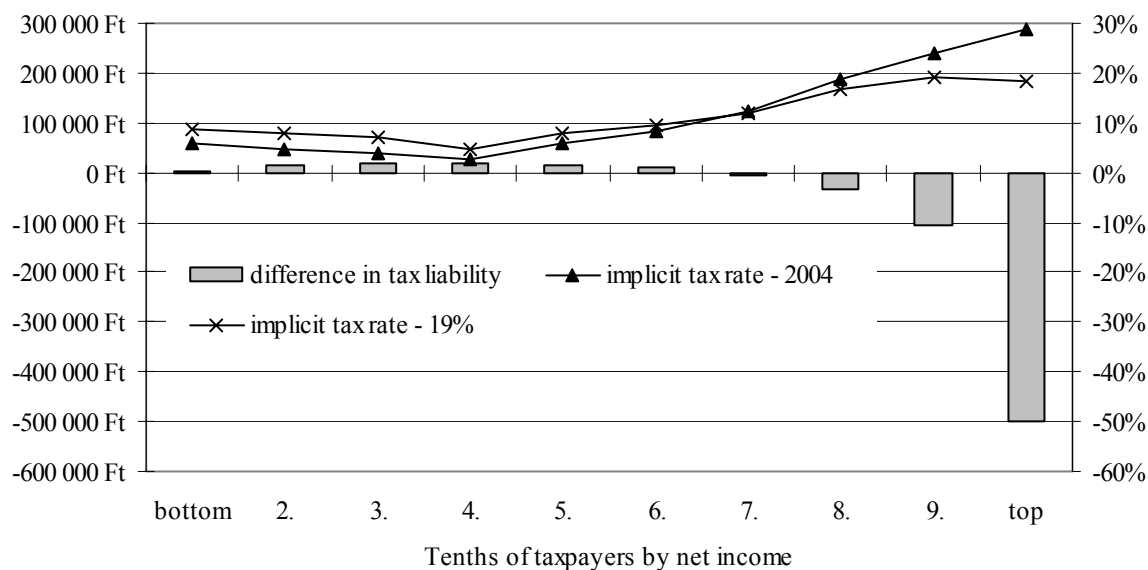
- there is a single tax rate of 19%, which applies to separately taxed incomes as well. However, the employee tax credit and the supplementary tax credit (minimum wage tax exemption) are retained;
- VAT and revenue tax rates are also 19%; no 0% or any other preferential tax rate;
- no car registration fee;
- all tax benefits eliminated (except in the case of tax already paid abroad);
- all benefits are eliminated (child care aid, maternity benefit, family support, gas price subsidy, etc.);
- no changes other than as detailed above, i.e. entitlements, definitions, pension contributions, pension, unemployment benefit, etc. all remain as in 2004.

### *How the redistribution of income would change*

A 19% single tax rate (with tax exemption for minimum wage earners retained) would benefit primarily the higher-income groups. With the exception of the top fifth of the income distribution, there are no major differences in tax liability or implicit tax rates. The taxes paid by the richest would, however, be reduced substantially, along with their implicit tax rate.

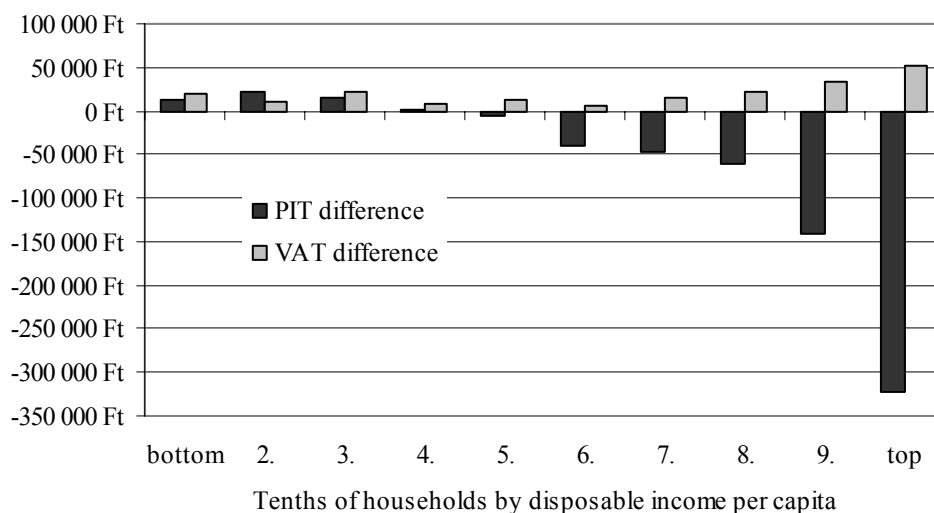


Figure 16. The tax liability (PIT) difference (between 19% and existing), and implicit tax rates in both cases, by *taxpayer* decile



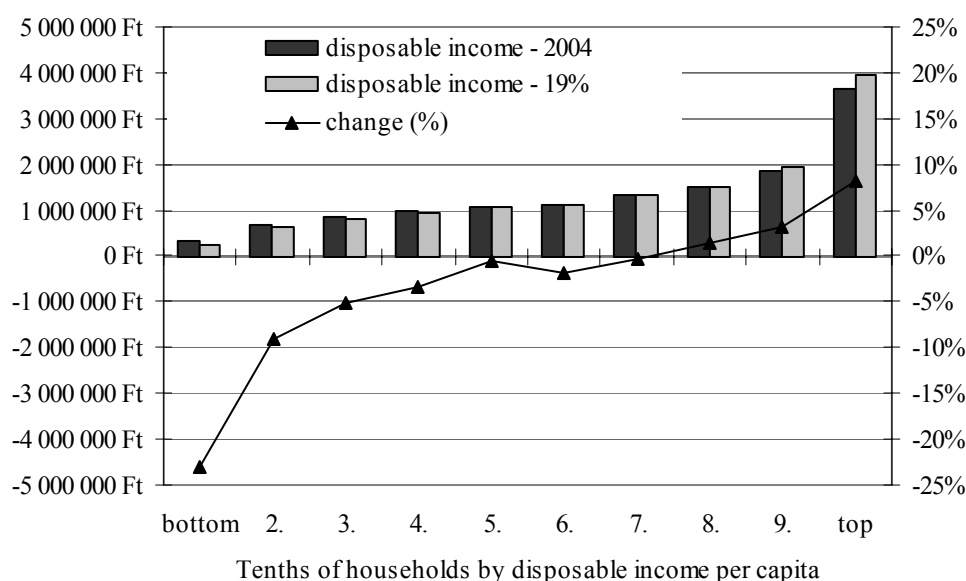
In the case of households, the personal income tax on the entire household would decline in the top half of the distribution, but the amount of VAT paid would increase in each decile. As a combined effect, the more affluent would be better off, i.e. the winners in such a tax simplification – in terms of total tax paid – would be those at the higher end of the scale, while the losers would belong to the bottom third of the income distribution range.

Figure 17. Growth of PIT and VAT paid by households, compared to the amounts paid in the 2004 system (set at 19%), by income decile



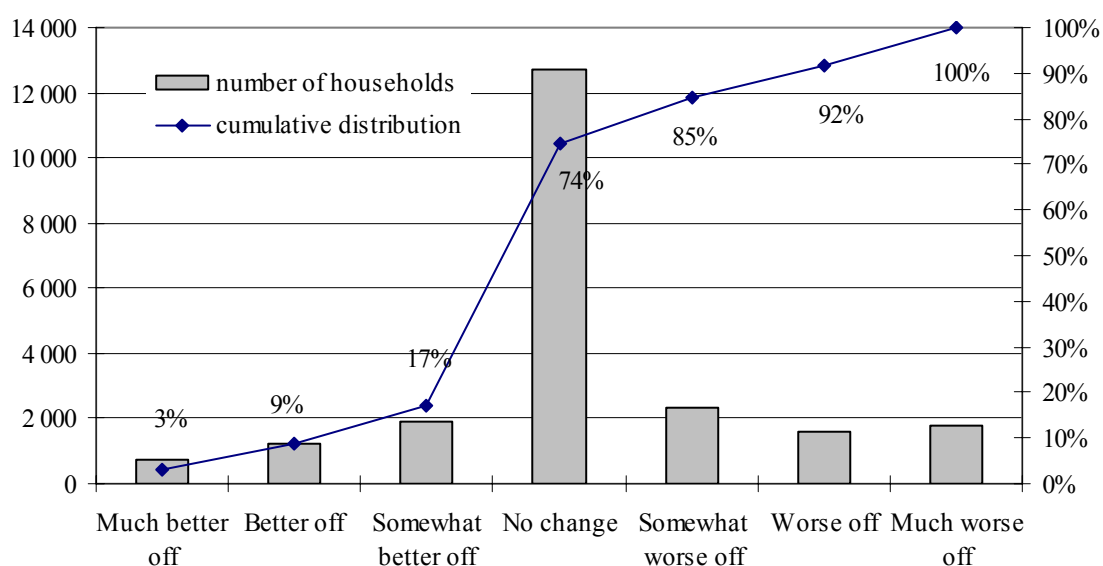
In terms of disposable income, it is the poorest that would be hardest hit by such a tax simplification. On the whole, only the top income group would see its disposable income increase significantly, while people in the bottom fifth would be left with substantially smaller disposable incomes. The reasons for this include the scrapping of central benefits and the cutting of the available tax allowances.

Figure 18. Equivalent per capita disposable income in the two versions and percentage difference between the original and the new system



Such a simplified tax system would benefit about 29% of households, while 26% of households would be worse off than at present. Things would not change for the remaining households. Other relevant data show, however, that the losers would be the poorest households, while richer households would tend to gain from the change. Accordingly, the introduction of such a tax regime would reduce the extent of income redistribution, as well as the degree of social solidarity.

Figure 19. The numbers and distribution of households gaining/losing from the changes<sup>20</sup>



### *Social minimum, instead of tax allowance*

*The parameters of this tax regime are as follows:*

- the tax schedule and the tax rates on incomes taxed separately are the same as in 2004;
- all tax allowances are removed (except for tax credit and supplementary tax credit), including family tax allowance;
- a new support structure is introduced, with the following eligibility criteria and rules: a person in whose family the per capita equivalent net income is below the annual amount of the minimum pension (that is 12 times HUF 23,200, or HUF 278,400 p.a.) is eligible and will receive a benefit equalling the difference between the minimum pension and his/her own income;
- the rest of the parameters (the elements of the family support system, other benefits, social security contributions, etc.) are identical to the parameters of the 2004 system.

<sup>20</sup> Winner and loser categories should be interpreted as follows:

*Much worse off*: whose per capita disposable income has dropped by more than 15%;

*Worse off*: whose per capita disposable income has dropped by 7 to 15%;

*Somewhat worse off*: whose per capita disposable income has dropped by 2 to 7%;

*No change*: whose per capita disposable income has not changed by more than 2%;

*Somewhat better off*: whose per capita disposable income has grown by 2 to 7%;

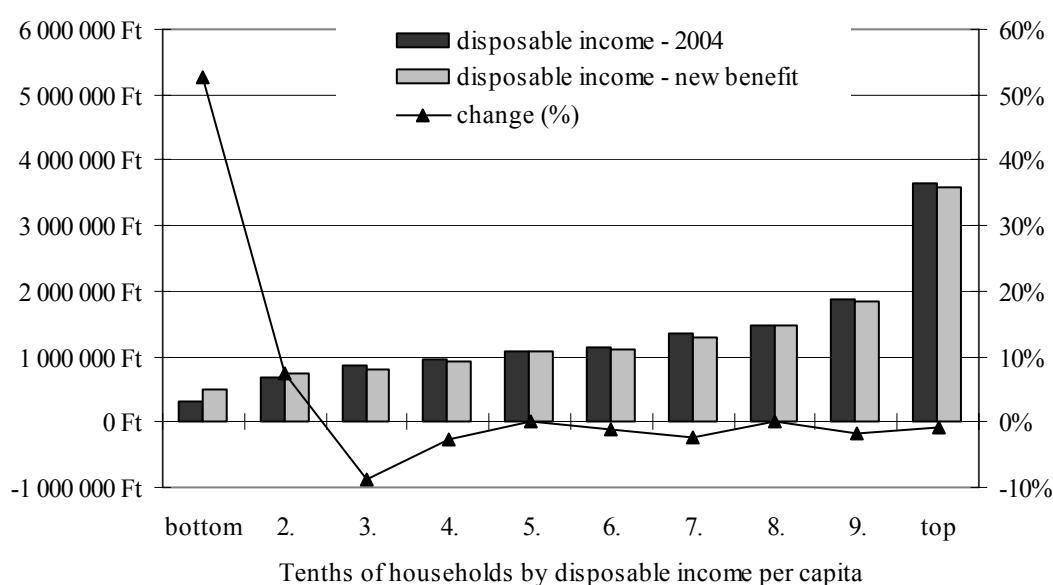
*Better off*: whose per capita disposable income has grown by 7 to 15%;

*Much better off*: whose per capita disposable income has grown by more than 15%.

### *Who would gain from this tax system?*

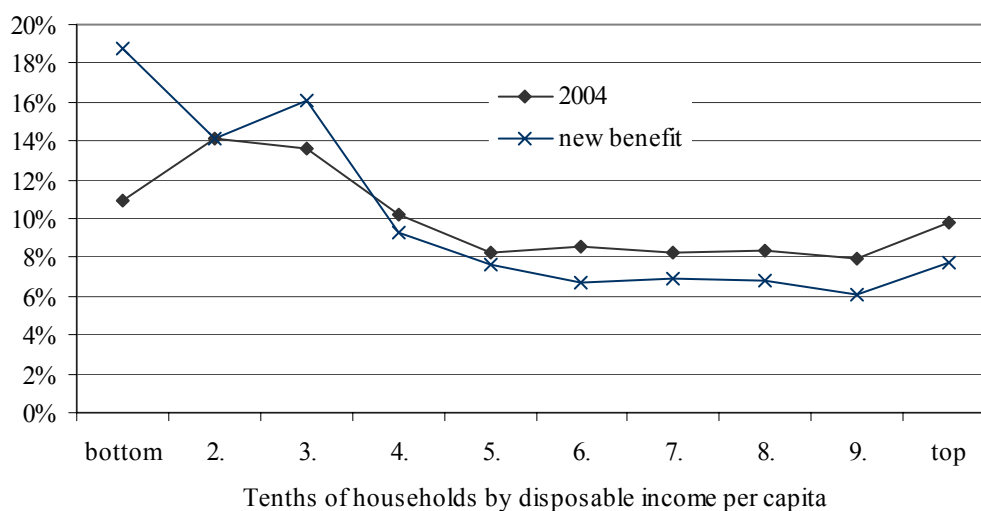
As expected, the general benefit, tied to income ceilings, would favour the poorest households, while the elimination of tax allowances would have an impact on the highest- income groups, for they could previously best exploit the allowances. This is clearly shown in Figure 20. Thus, only the lowest two deciles would be better off, and the remaining groups would lose on the changes. Such a conversion of tax allowances into benefits would increase social solidarity and reduce social differences. At the same time, it would probably result in disincentives with respect to the labour market.

*Figure 20. Change in equivalent per capita disposable income by decile*



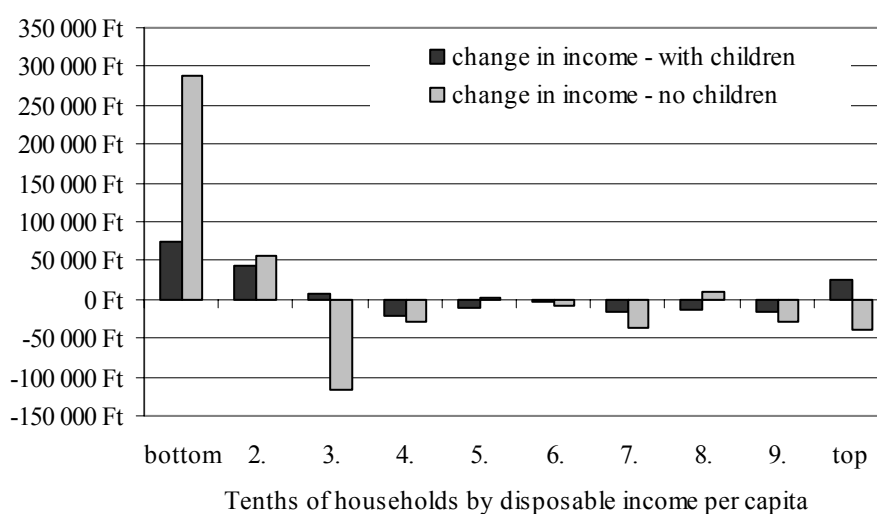
The increase in solidarity would also be apparent in the way the distribution of the total amount of tax allowances and central benefits is shifted towards the lower-income deciles. Consequently, the relatively large share of benefits currently claimed by the high-income groups would be reduced somewhat. Furthermore, some rearrangement would take place among the bottom deciles as well, since the very lowest decile would no longer receive less of the total benefits than the second poorest one.

Figure 21. Distribution of total tax allowances and benefits by decile



The introduction of a new benefit and the scrapping of tax allowances would have the greatest impact on the status of the neediest households, whether with or without children. Among those without children, households in the poorest tenth would be the clear winners, and households a little better off would be the big losers. The reason for this is probably the loss of the tax allowance. In the case of households with children, those in the poorest third would stand to gain from the new regulations.

Figure 22. Change in equivalent per capita disposable income in households with and without children



## **8. Opportunities for applying the microsimulation technique and the directions of its development in Hungary**

- The spread of the technique would help political decisions to be made about the goals of redistribution, and would enable identification of the most suitable tools for the given objectives.
- Since microsimulation is a tool that admits of standardisation, it enables European comparisons as well. One example of this is the aforementioned EUROMOD, which is an interconnected network of European microsimulation databases. The inclusion of the new EU member states will assist in its expansion.
- Since this is a new technique, whose development and testing will require additional work, it is important to have similar tools outside the state administration system, i.e. research institutions and analysts should also produce such analyses. The ensuing professional discussion would promote continued development of the technique in Hungary.
- Regular updating is essential if the technique is to grow more precise. This should involve considering ways in which existing databases of raw data could be improved.
- One priority could be the development of impact assessments in a way that will enable increasingly precise quantification of the macro-effects of reform proposals.
- At present research is carried out at various locations in order to 'build dynamic into' the microsimulation models. The microsimulation model developed in Hungary should also be thus improved, for then it would be possible to factor labour market and consumer responses, as well as the effects of incentives, into the analyses.

## References

- Alm, James (1996). What Is an „Optimal Tax System?”. *National Tax Journal*, Vol. 49 no. 1, 117-133,
- Atkinson, A.B., Stiglitz, J.E., 1976. The design of tax structure: direct versus indirect taxation. *Journal of Public Economics* 6, 55– 75.
- Benedek D., O. Lelkes, Á. Scharle and M. Szabó (2004). „The structure of general government expenditure and revenues in Hungary, 1991-2002”. *MoF Working Papers* 9.
- Boadway, Robin, M. Marchand and P. Pestieau (1994). “Towards a Theory of Direct-Indirect Tax Mix”. *Journal of Public Economics* 55, 71–88.
- Cabinet Office Performance and Innovation Unit (2000), “Adding it up - Improving Analysis and Modelling in Central Government”, Case studies, London
- KSH (2004), Háztartás-statisztikai közlemények, 25. szám, 2004. I. félév, Központi Statisztikai Hivatal, Budapest:  
<http://portal.ksh.hu/pls/ksh/docs/hun/xftp/idoszaki/haztart/haztart0406.pdf>, January 10, 2005 download
- Lakin, C. (2002). "The effects of taxes and benefits on household income, 2000-01". *Economic Trends* No 582, May 2002
- Lelkes Orsolya (2002). „Well-being and inequality in transition. The case of Hungary”. PhD Thesis. London School of Economics, London.
- A New Dynamism for Hungary! The programme of the government of the Republic of Hungary for a free and just Hungary, 2004–2006, Budapest, Sept. 2004;  
<http://www.miniszterelnok.hu/domain2/files/modules/module15/3403A2F6A41C017.pdf>, December 7, 2004 download
- Saez, E. (2002). The desirability of commodity taxation under non-linear income taxation and heterogeneous tastes. *Journal of Public Economics* 83, 217– 230.

## Appendix

### **Matching and multiple imputation (an extract from the *TÁRSZIM 2004 Professional microsimulation model v2.1 User Manual*. Author: TÁRKI Rt.)**

#### *The process of matching and multiple imputation*

The three databases used in building the model – TÁRKI Monitor, CSO Household Budget Survey and APEH tax return data – were aligned with one another using the method of multiple imputation. Multiple imputation is a method used to tackle lack of data, whereby a missing detail is replaced by several values, rather than by a single value, which virtually enhances the database. The distribution of the substituted data series will be as close as possible to the distribution from which the missing data would originate. The basic concept of multiple imputation is used to create a microsimulation database by considering the data for the households contained in the TÁRKI Monitor data file that are included in other data files (e.g. consumption data in the Household Budget Survey of the Central Statistics Office) as missing data, which are substituted from these data files. In order to make the households for which substitute data are used match the original households as closely as possible, such categories are defined on the basis of the social and demographic data contained in both surveys; the missing features of the original household may then be replaced by data for a household that is suitable from the largest number of perspectives. This procedure is called matching. The multiple imputation of the data not included in the TÁRKI Monitor and the principles of matching required for imputation are identical in the case of each of the data sources, and only the variables used for imputation are different. The common principles and aspects are described only for imputation of CSO data.

In the course of multiple imputation we choose ten households from the CSO sample for each TÁRKI Monitor household and we assume that the consumption data of the given TÁRKI Monitor household have the same distribution as the distribution of the consumption data of the ten CSO households selected. The validity of this assumption depends on whether there are variables whose identical value between two households will result in the same or similar consumption patterns; and if there are such variables, whether it is possible to find households in the CSO sample for each TÁRKI Monitor household that are similar enough from the perspective of these variables. To ensure the reliability of this matching procedure, therefore, the largest possible number of variables should be taken into account; feasibility requires that matching should be carried out only on the basis of variables that are included in both databases, and that each TÁRKI Monitor household should be specified with the aid of such variables only so long as there are several households with such specifications in the CSO sample.

We try to meet these conflicting requirements by applying a dynamic matching algorithm, which matches households in larger groups on the basis of larger numbers of variables, and matches households in smaller groups on the basis of smaller numbers of variables. The variables used for matching include the size of the household (this is the most important matching variable), the number of children,



the region, the regional net income fifth, the educational level of the head of the household, the type of municipality, and whether there is a pensioner in the household (this being the least important matching variable).

If there are at least 10 CSO households matching a TÁRKI Monitor household in terms of each of the above variables, then 10 of them will be chosen by random selection and their data will be imputed to the TÁRKI Monitor household. If there are fewer than 10 such households, the least important matching variable is dropped and we check whether there are at least 10 CSO households matching the TÁRKI Monitor household in terms of the remaining matching variables; if there are, the ten households to be imputed to the TÁRKI Monitor household will be chosen from among these. If there are not, another matching variable is dropped, and so on.

If there is only one matching variable left for a given TÁRKI Monitor household (i.e. the size of the household) and we still do not find 10 matching households from among the CSO households, then from among the (fewer than 10) households found, the 10 households to be imputed will be chosen by sampling with replacement. This is carried out in the same way for all the TÁRKI Monitor households involved in the imputation exercise.

If we do not manage to find a sufficient number of matching households according to the regional net income fifth, we consolidate the 1-2 and the 3-4-5 fifths, and matches are sought in this way, at a lower level of precision. Likewise, for the number of children, if not enough matching households are found for the child-number variable, the 'one child' and the 'more children' categories are consolidated and matches are then sought.

In the set of households generated through multiple imputation, each of the 2,334 households of the TÁRKI Monitor occurs ten times, and for each of these the variables of the Monitor and the CSO will be included. The values of the Monitor data will be the same for each of the ten instances, but the values of the variables of the CSO survey will differ to some degree in each of the ten cases (since they originate from different, real families).

The data for individuals contained in the APEH tax return data file will be similarly imputed to the 2,380 people (of the 4,487 people in the TÁRKI Monitor) who have submitted tax returns.

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